

AVIATION WEEK

A MCGRAW-HILL PUBLICATION

JAN. 9, 1950



Capital is first major U.S. airline to use Cross-Wind Landing Wheels

SOON to go into service, Capital Airlines' new fleet of Super DC-3's will be equipped with Goodyear Cross-Wind Landing Wheels—the first U.S. airline to adopt this modern landing gear in cooperation with the CAA policy to increase the acceptance rate of airports. With this new

gear Capital Super DC-3's will be able to take off and land in cross winds of high velocity. Aviation Products Division, Goodyear, Akron 16, Ohio.

More aircraft land on Goodyear tires, tubes, wheels and brakes than on any other kind.





Safe, accurate
and dependable
controls
promote the future
of aviation.



CREATIVE ENGINEERING

Makers of the Famous R-H
Electronic Autopilot, Fuel Dept.
and Turbo Supercharger Gen-
erators, Standard on Many Types
of JAP Aircraft



MINNEAPOLIS
Honeywell
AERONAUTICAL CONTROLS

The bare facts about ball bearings



Cut away shows
New Departure
Ball Bearing

Rugged New Departure
Ball Bearings lick friction
with free-rolling, tough,
forged steel balls.

They welcome today's
more exacting require-
ments of higher speeds,
heavier loads and con-
tinued precise positioning
of moving parts.

And...most important
of all, New Departure,
world's greatest ball
bearing maker, meets
your particular problems
with a vast fund of ex-
perience and original
thinking.

Nothing Rolls Like a Ball
**NEW DEPARTURE
BALL BEARINGS**



Nothing Rolls Like a Ball. It's a unique feature...bearing...Having as much as 100 times as much resistance...



Under heavy conditions, it...bearing...Having as much as 100 times as much resistance...



Its inherent resistance to heat...bearing...Having as much as 100 times as much resistance...



This is how a ball makes them...bearing...Having as much as 100 times as much resistance...



Put two rows of balls together...bearing...Having as much as 100 times as much resistance...



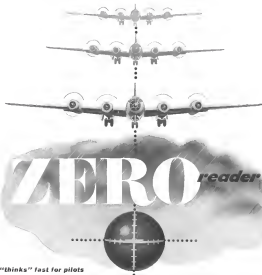
Unlike other types of rolling...bearing...Having as much as 100 times as much resistance...



Only ball bearings can be self...bearing...Having as much as 100 times as much resistance...



Mount new departures in New...bearing...Having as much as 100 times as much resistance...



"thinks" fast for pilots

Sperry's new simplified gyroscopic indicator—the zero reader—(a) fast thinking collector, it continuously gyroscopically tracks altitude, heading and radio path information and relieves the pilot of complex mental calculations on approaches and landings. (b) amplifies an exact flying procedure, leaving more time to devote to other problems vital to the success of his flight plan.

• Sperry introduced the Gyro-Horizon, Directional Gyro, Gyroscopic Compass and Gyroplot. Now Sperry

introduces the zero reader which is the only manual system approaching the performance of stabilized automatic flight control, another progressive step toward the development of all-weather operations.

• Developed by Sperry with the

cooperation and encouragement of Air Weather Flying Division, USAF and the Air Transport Association, the zero reader is an example of Sperry's never-ending search for new and better ways to improve flying techniques.

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Supersonic Footnote

Even before the USAF official denial of the Los Angeles Times story that the Bell X-1 supersonic research plane had achieved a maximum speed of 1959 mph, aeronautical engineers had been keeping scorebook quietly at the quiet figure.

That particular combination of digits is the midgeobolus product of Mach 3.0 times 662 mph (the speed of sound above 35,000 ft) under standard NACA atmospheric conditions.

It would be singularly unusual for the X-1 to have exactly standard atmospheric conditions including a temperature of minus 57 deg. Normally, temperature at 35,000 ft is much colder, with the effect of reducing the speed of sound at that altitude to a value below 662 mph (Aviation Week, Aug. 12, 1949).

It would be quite rare also for an aircraft to attain exactly three times the speed of sound, since supersonic speed up until now has been obtained by plotted results in tests of wind tunnels rather than in steady level flight with fully constant increments of additional speed.

Officially released data for the X-1 quotes a design Mach number at 1.5 at 60,000 ft. Under standard atmospheric conditions that would be just under 1000 mph. This figure is generally accepted, if so far unconfirmed officially, at the plane's initial entrance performance. A design tip point for the Bell X-1A, an improved version using turbine-driven fuel pumps, has been officially quoted at 1700 mph at 85,000 ft. USAF has declared that the X-1A has not yet been flown. But with other versions of the X-1 the speed of 1000 mph appears substantially impossible.

Bell is currently producing four X-1A research planes and a companion version of the long-delayed X-1 research plane which has a design capability of well over Mach 3.0. Both types are scheduled for completion this year.

JATO for Transport

Proposed CAA manual for transport aircraft flight requirements, a meeting with industry engineering engineers is expected to be an influence to jet-assisted takeoff units. The transport manufacturer object to the idea of carrying two or three extra sets of JATO, arguing that the fuel tank would create the need for moment might also destroy the aircraft so that no matter how many units were carried they would be no use.

NEWS SIDELIGHTS

Credits for X-1

Project that the Institute of the Aeronautical Sciences sponsor a project to establish an authentic list of "important events such as progress leading to man's first supersonic flight," has been made by Robert M. Stanley, former Bell Aircraft Corp. vice president and chief engineer, now head of his own company, Stanley Aviation Corp., Buffalo. Stanley's proposal followed a statement attributed to Bell Aircraft that supersonic X-1 research plane was designed by Robert J. Woods, now Bell's chief engineer. Stanley said the statement was "incomplete in the terms that designed the airplane."

Stanley cited Bennett Harbin, Bell project engineer, as the X-1 designer "of 13 and a name a single person." Men who "made it a practical reality" include R. J. Smithson, now Bell executive chief engineer, Stanley W. Smith, Bell project engineer, Richard H. Ford, former Bell engineer, now with Stanley's company, "and a hundred other people." Stanley said Woods and the Bell company made no comment on the Stanley statement.

Problem is rather of establishing the ability of JATO units under expected takeoff operating conditions, the manufacturers contend. It is concluded that the amount of JATO used on a transport be determined within limits of controllability, and that if the airplane failed to takeoff, it is required as a result of using JATO for non-critical performance requirement that the rockets be used for all takeoff. The proposed manual states that "it now appears that some of the units are valuable reliable to be used in determining performance and performance requirements." Manual would require then additional safety sets of rocket units in addition to activate use of the duration of a single set of JATO is less than 15 min. or one minute or if the duration is more than 15 min.

Helicopter Towing

New details on the postwar air helicopter towing as perfect experiment by USU at Wright Field, on

data that is a somewhat different procedure from the towing of gliders. The helicopter takes off under its own power, and looks as in order to the cable dragging from the front wing tow plane, instead of being "hooked up" at the beginning of a tow. After the helicopter and tow plane make contact, the helicopter gradually reduces its power until it finally cuts its engine completely, while the forward momentum from the tow plane takes the towing into automation. Object of the law is to extend the rope's range.

Airline Subsidy

Airlines will be the target of charges of "government over-subsidization" from two new congressional quarters this session. The Senate Interstate and Foreign Commerce Subcommittee on Communications, headed by Sen. Ernest McFarland (D. Ariz.) and the Subcommittee on Domestic Land Transportation, headed by Sen. Francis McNamara (D. Pa.) McFarland has long been publicly sympathetic to Western Union Telegraph Company's claim that its deal with cheap rates made possible by government subsidization, has not deeply into telegraph business and is an important cause for Western Union's recent record financial losses. The McNamara committee will get additional information on how subsidization by forcing their competition that will see subsidization makes it possible for airlines to offer economically low passenger fares and capture traffic which should logically go to airlines. The grounds for both over-subsidization has been that by professional staff members, and open hearings will be launched by both administrations in a few weeks.

Committee Change

Sen. Owen Brewster (R. Me.), for six decades of the Joint Congressional Airway Policy Study, steps up to be Senate No. 2 Subcommittee on Interstate and Foreign Commerce Committee, as a result of the death of Sen. Clyde Reed (R., Kan.). On the GOP side, he is ranked only by Sen. Charles McNamara (R., N. H.). In the rather doubtful event of Republican gaining control, Brewster would probably take over the Commerce Committee chairmanship because Taylor is in line for the Banking and Commerce Committee chairmanship. Republican seat was given more early and held more than any have in order to capture Senate control next November.

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Lavelle AIRCRAFT CORPORATION
NEW TOWN, NEW YORK

AVIATION CALENDAR

- Jan. 9-15—Annual meeting and engineering display, Society of Automotive Engineers, Hotel Brook College, Detroit.
- Jan. 10-17—Fourth annual Air Transportations Institute, conducted by American University in conjunction with CAA and ATA, Washington, D.C.
- Jan. 11-12—Air Force-Navy industry meeting to discuss aviation trade relations, Washington.
- Jan. 11-13—All American Air Mechanics, Akron.
- Jan. 14-15—Miami-Havana Air Cruise for raising funds, conducted by Hawks Air Force Club.
- Jan. 16-18—First Maintenance Show, open to all American Society of Mechanical Engineers and the Society for the Advancement of Maintenance, Cleveland, Ohio.
- Jan. 17-18—Annual dinner of the Traffic Club of Philadelphia, Sheraton Franklin Hotel, Philadelphia.
- Jan. 17-19—University of Illinois second annual Clinton Spence Operations school, Urbana, Ill.
- Jan. 21-25—45 annual Henry Night dinner, Hotel Astor, New York, N.Y.
- Jan. 23-26—24th 1966 annual meeting, technical session, Hotel Astor, New York, N.Y.
- Jan. 26-28—Navy seminar, ICAO Council, Monterey.
- Feb. 13-16—National Spontaneous's Show, Grand Central Palace, New York, N.Y.
- Feb. 19—15th annual meeting, American Society for Testing Materials, Hotel Waldorf Astor, Pittsburgh.
- Mar. 6-10—47th annual meeting, American Road Builders' Assn., Northbrook Plaza Hotel, Cleveland.
- Mar. 24-25—25th annual flight population meeting, sponsored by the Institute of the Aeronautical Sciences, Carter Hotel, Cleveland.
- Mar. 25-31—National Plastics Exposition, sponsored by Society of the Plastics Industry, New York, Chicago.
- Apr. 4-6—Engineering and Maintenance conference, Air Transport Assn., Hotel Grand Central, Kansas City.
- Apr. 6-8—National Production Exposition sponsored by the Chicago Technical Society Council, Shermans Hotel, Chicago.
- Apr. 16-20—Annual business meeting, Airline Assn. of Airport Executives, Waldorf Hotel, Columbia, Ohio.
- Apr. 17-19—14th aerospace meeting, Society of Automotive Engineers, Sheraton Hotel, New York City.
- May 1-6—Midwestern conference on fuel additives and the annual meeting of the American Plastics Society, Sheraton Hotel, Kansas City.
- June 24-18—51st annual meeting, American Society for Testing Materials, south exhibit building, including expanded and related equipment, Chubb-Hudon Hall, St. Louis, Mo.
- June 24-25—51st annual meeting, American Society for Testing Materials, south exhibit building, including expanded and related equipment, Chubb-Hudon Hall, St. Louis, Mo.

PICTURE CREDITS

14—Associated Aircraft Corp. 15—OET
16—Cameron 16—Boeing Aircraft Corp.
17—A-1



WE'RE KNOWN BY THE COMPANY WE KEEP!

Since 1951, Sealed and Worned Airlines has served over 5,000,000 air miles of flight in 31 countries from New York to Singapore. This growing past demands constant development and efficiency of both men and machines. There is no margin for error in S&W's express men, their way they do it. Sealed, the world's most experienced maintenance and supply base, to serve this real world to keep these DC-4s working on schedule. Here's per member person in PAC's.

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NEWS DIGEST

DOMESTIC

Eastern Air Lines has filed a \$500,000 damage suit against Capital Rock Bros. Brothers in Washington, D.C., District Court, charging the Baltimore pilot was responsible for the collision with an EAL DC-4 near Washington National Airport, Nov. 1. The suit covers only the destruction of the DC-4 and does not allocate liability for the plane's 57 occupants who were killed.

Joseph Cochran established a new world speed record for propeller-driven aircraft, flying an F-51 around a 500 km course at a speed of 494 mph. Flight was under restricted conditions set by the Fédération Aéronautique Internationale, with judges and timers appointed by the National Aeronautics Assn.

Gerd Van Dusen, systems engineer, claimed to have devised jet engine gas-propeller synchronization, died in Berlin after a two-minute illness. He was 56. Van Dusen also worked on airplane wing design, a propeller spinner design and turbojet gas.

Personal aircraft shipments by one company totaled 182 in November, according to Personal Aircraft Council of the Aircraft Industries Assn. Shipments included 184 four-place and 37 one- and two-place aircraft, with total value of \$705,000. Previous monthly shipments of 288 aircraft were valued at \$963,800. Total for 11 months of 1947 was 3353 personal aircraft shipped, at a value of \$13,622,600.

A federal judge has signed a stipulation between Pan American Airways and Trans World Airline prohibiting PAA from transporting passengers between Rome and the United States pending a ruling by the Civil Aeronautics Board (November 26th, Jan. 1). Stipulation also says PAA will not "directly or indirectly, solicit passengers or cargo for this service or advertise such service to the public."

A 31.55-hour minimum wage for government contracts as the security industry has been recommended in Wage-Hour Administrator William A. McNamara by wage determination staff. Could be by wage determination staff used in July to be the figure finally chosen. Administrator's decision is being delayed pending determination of the issue from computing the aircraft industry. It contains "minor" changes of the industry are excluded as planned, the hourly minimum wage pay table higher.

Northwest Airlines has taken deliv-

ery of tenth and first statements. Pan American Airways also took delivery of the last of its 50 aircraft order of the 1st is assigning the craft to its Pacific Alaska division.

Pan American Airways Corp. was authorized by Pan American Airways, Inc., and the name of the latter changed to Pan American World Airways, Inc., in a simplification of PAA's corporate set-up.

FINANCIAL

Continental Can & Foundry Co., for fiscal year ended Sept. 30, reported net profit, after taxes and other provisions, of \$1,152,651. Aircraft division has additional order for modification of North American Harvard trainers and other work for the USAF and is actively engaged in further sales of the new main utility aircraft.

INTERNATIONAL

Pilot case was reported as the possible cause of the KLM Royal Dutch aircraft crash July 12 near Baven, which killed the crew of 11 and 14 passengers, including 13 U.S. passengers. Report was issued by an investigation committee of the Indian government. Two probable individual causes were also indicated. Traffic control should have held the plane over the field until weather cleared or diverted it to another airport; crew was responsible for misreading KLM heading and specific weather information; it did not use the windfall readings, pilot possibly was unaware of height of the hills near the airport, and pilot failed to act correctly to permit an adequate rate of climb. Schedule was not met in a possible cause.

Agriculture air contractors have virtually severed by a strike lock-out of all foreign carrier ground personnel Pan American has terminating flights to Minneapolis, and Chicago was using Santiago, although other airlines still stopped at the end at Simon Airport. Workers were demanding an average 50 percent increase in wages.

Vogelstein will be permitted to purchase American commercial aircraft on terms and cost reduction equipment but will not be allowed purchase of any military type aircraft engines. Export business reportedly have been around for DC-3 type engines, 500, 600, 700, 800, 900, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, 1800, 1900, 2000, 2100, 2200, 2300, 2400, 2500, 2600, 2700, 2800, 2900, 3000, 3100, 3200, 3300, 3400, 3500, 3600, 3700, 3800, 3900, 4000, 4100, 4200, 4300, 4400, 4500, 4600, 4700, 4800, 4900, 5000, 5100, 5200, 5300, 5400, 5500, 5600, 5700, 5800, 5900, 6000, 6100, 6200, 6300, 6400, 6500, 6600, 6700, 6800, 6900, 7000, 7100, 7200, 7300, 7400, 7500, 7600, 7700, 7800, 7900, 8000, 8100, 8200, 8300, 8400, 8500, 8600, 8700, 8800, 8900, 9000, 9100, 9200, 9300, 9400, 9500, 9600, 9700, 9800, 9900, 10000, 10100, 10200, 10300, 10400, 10500, 10600, 10700, 10800, 10900, 11000, 11100, 11200, 11300, 11400, 11500, 11600, 11700, 11800, 11900, 12000, 12100, 12200, 12300, 12400, 12500, 12600, 12700, 12800, 12900, 13000, 13100, 13200, 13300, 13400, 13500, 13600, 13700, 13800, 13900, 14000, 14100, 14200, 14300, 14400, 14500, 14600, 14700, 14800, 14900, 15000, 15100, 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PLANE FAX

Quick picture of PALO ALTO AIRPORT Calif.

View of U.S. military pilots in jumps learned by CAA in unique planes and engines • Air Search and Rescue • Medical services, Palo Alto School of Aviation • Passed earnings lighted on repairs • Hudson Standard Service airplanes around aircrafts Chevron gas RPM oil and grease

How airport owners help pilots keep costs down



Jack Nyström, Superintendent of Maintenance at Palo Alto Airport, has worked all phases at his field on RPM Aviation Oil. The cause of RPM engines running cleaner and faster, and cuts costs by reducing wear on vital parts. We use RPM in our 16 Novans based in the field and in 115 ad-

danced Novans that fly over the field for service and repair work. One Continental 1187 was repaired after 1100 hours. The attitude of engine wear was negligible, and the rigging and valve work in excellent condition. The internal parts required only a washing oil with a solvent.

"We feel that RPM Aviation Oil has done us a great service. And we will be only too glad to have you inspect any of our engine engines when we take them down so that you can see for yourselves what a really good oil can do."



Tips of the Month

"Let's get rid of 'pilot error'!"

"These notes are fundamental—but easy to forget. They make flying safer—and more fun."

1. Keep the plane clean—inside and out
2. Watch the fuel gauge—don't overfill
3. Follow the pre-arrival maintenance schedule
4. Don't hedge but fly the way you do it only once!

Jack Nyström, Dept. of Maintenance, Palo Alto Airport

Pilots now request new Chevron 80/87 Gasoline—enjoy more power, smoother take-offs

"Everybody in the field has been asking for the new Chevron 80/87 Gasoline," writes Mr. Nyström, "and we've had very good comments from all the pilots—many of whom had been using other brand fuels. We've found that it ends take-off banking and pre-ignition, and gives us more power than the old 80 octane gasoline. It's a considerably good deal for the pilots who had been using 90/90 gasoline—because Chevron 80/87 costs less and saves them money."



WHO'S WHERE

Changes

► **Sales Appointments**—Gillies Bros., Inc., has appointed Frank B. Taylor, who represents the Southern California area for their aircraft parts division. Edward F. Ross has been named to the newly created post of district sales manager in the North Atlantic for the New York and Washington, N. C., and Norfolk, Va., areas. He was formerly SAI sales manager at Norfolk. B. M. Kemp has been appointed sales manager of government sales for United States, with responsibility for developing business between government agencies on a voluntary basis.

► **Mississippi (Honeywell) Regulator**—Colonel Fred Kowal, Midwest regional manager since 1962, filed with manager. Clarence E. Pittman, formerly Midwest manager, Green S. Tomlinson is now Pacific area manager, and Russell C. Casing, has become technical manager of the San Francisco office. E. A. Tuck, formerly head of John A. Borchgrevink Sons Co.'s San Francisco office, is now manager of sales for the company's Chicago corporation. G. C. Behrnsky, formerly Tuck in the California corporation.

► **New Job—James Hollins** has been named assistant district manager for Alton division of General Motors, managing James Crooks. Hollins was formerly with the East-Ohio-Michigan Pacific division.

► **East Atlantic Sales S. Mueller, ISM (SAE)** has been appointed assistant executive manager in the Pacific Atlantic Power Laboratory of General Electric Co. American Oil Co. secured I. J. Lee, vice president and operations and Max T. Schwartz, regional.

Elections and Honors

► **New Executive—Fred Clement** has elected to his membership of his board of directors. Edward C. McKinnon, 19 votes, Arthur C. Pope, 19 votes, including J. H. Heltman, 19 votes, and J. J. Whitlock, president of the First National Bank of Oklahoma City.

► **New Officers—William S. Venable** has been elected district manager of Aircraft Engine & Parts Corp. He was formerly with Hudson & Sells and Power Waterhouse & Co.

► **Honorary—John E. Gellert**, president of the B. F. Goodrich Co., has been made a member of the Legion of Honor by the French Republic. Harold B. Bagge, recently retired president of Fiat American Corp., is a member of its board, was honored for 20 years of service to the airline. Bagge was presented with an album of photographs, representing some of the highlights in the company's early development.

INDUSTRY OBSERVER

► **Reconsider of War Assets Administration's surplus aircraft components of original value of \$200 million will be closed out by its successor agency, General Services Administration, by June 30, in a series of sales following abolition of WAA at year's end.**

► **Regional technical CAA supervisors contract under the new proposed regional plan to give representatives all general aircraft responsibility for certification of short planes, manufacturers and parts, advantages, but if the supervisors can be established in Washington, thereby eliminating considerable regional red tape, several of the manufacturers are expected to go for the new plan.**

► **Seattle-McDonnell Institute, Columbia, Ohio, is now a key base research establishment for the USAF, as the recent award of an new USAF aircraft contracts to the turboprop turboprops.**

► **Borg-Warner Corp. at Wichita has modified the controls of the XL-15 most basic plane requiring rubber tube and adding tube for increased wire control, in order to get quicker response to controls at short speeds. McDonnell XL-15 is now undergoing an evaluation by Army Flight Forces at Ft. Bragg, N. C.**

► **Insurers regarding CAA certification for the new piston-jet engine developed at Boeing-Seattle in turboprop (Model 500) and dual piston (Model 502) versions, indicate that the Seattle manufacturer may seek commercial approval for the engine soon. Model 500 develops 180 hp thrust, while Model 502 develops 160 shaft hp with a 200 hp emergency rating.**

► **USAFA has studied Keesler-France Corp. out of Adams, N.Y., plant which the sole manufacturer now using for storage purposes, in order to use the plant for the big Canadian aluminum extrusion process which are required in some new turbine manufacturing techniques. Air Materiel Command will operate the process and start later to produce valves on an experimental basis. Process have started in Adams from Germany and are being assembled.**

► **Aeronautical technical subcommittee of the Air Coordinating Committee is recommending that no international aircraft standards be prescribed either for transport jet aircraft or for helicopters until some operational experience is available, and that member states of NATO be asked to exchange views on aircraft standards, these aircraft in preparation for standards at a later time.**

► **An ICAO questionnaire on the establishment of various international categories of transport planes is expected to get a reply from the U. S. indicating that establishment of other categories than "A," the highest standard of performance safety, is impossible, and that member states of ICAO be asked to exchange views on aircraft standards, these aircraft in preparation for standards at a later time.**

► **Review of radio interference levels for aircraft installation of a printing of annual survey and annual industry representatives in Washington, June 18, is expected to result in improved procedures and reduction of objection and testing costs. Meeting is an outgrowth of industry, Navy and Research & Development Board panel studies on interference.**

► **Boeing-Seattle engineers develop their studies production of an improved series of five and six cylinder high torque aircraft engines, using higher quality materials, and designed for improved performance, improved fuel economy, and improved reliability, aimed principally at advanced engine and turbojet engines in the lightplane field. Designation on the new series include SHLN, SHLN, SHLN, SHLN and SHLN. A dual number 50 is added for comparison without engine coupling, a dual number 50 is used with each designator of engine coupling is applied.**

► **An AIA survey of aircraft industry engineers indicates a general preference for the SAE-ASTM turbine-turbine conversion table used by other industries, over a table currently listed as federal specification GPM-4511 based on Air Materiel Command test data compiled some time ago. Since the survey was made it is expected to appear likely that the SAE conversion table may eventually be adopted to replace the ASAC table.**



Beechcraft A35

The Beechcraft A35 cruises at 170 mph, carries four people in its comfortable cabin. Range is 130 miles, top speed, 164 mph. It excels in safety, simplicity, comfort, economy, speed and performance... It is equipped for day, night, and instrument flight.

Beechcraft 18

The two-engine Beechcraft 18 carries 10 passengers in its roomy cabin. It is the most dependable performance. This 180 mph plane carries 7 to 8 passengers in business comfort — can be operated readily out of small fields.



They outsold all others in their respective classes during 1949

Beechcraft

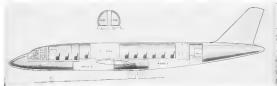
for the TOP5 in Performance, Strength, Speed, Style, Safety and Comfort
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Airlines, Hartford; DELAWARE—Delaware Airlines, Newark; FLORIDA—Florida
Airlines, Orlando; GEORGIA—Georgia Airways, Atlanta; ILLINOIS—Midwest
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Airlines, St. Louis; MONTANA—Montana Airlines, Helena; NEBRASKA—Nebraska
Airlines, Omaha; NEVADA—Nevada Airlines, Las Vegas; NEW HAMPSHIRE—New
Hampshire Airlines, Manchester; NEW JERSEY—New Jersey Airlines, Newark; NEW
MEXICO—New Mexico Airlines, Albuquerque; NEW YORK—New York Airlines, New York; NORTH
CAROLINA—North Carolina Airlines, Charlotte; NORTH DAKOTA—North Dakota
Airlines, Grand Forks; OHIO—Ohio Airlines, Cleveland; OKLAHOMA—Oklahoma
Airlines, Oklahoma City; OREGON—Oregon Airlines, Portland; PENNSYLVANIA—Pennsylvania
Airlines, Philadelphia; RHODE ISLAND—Rhode Island Airlines, Providence; SOUTH
CAROLINA—South Carolina Airlines, Columbia; SOUTH DAKOTA—South Dakota
Airlines, Sioux Falls; TENNESSEE—Tennessee Airways, Nashville; TEXAS—Texas
Airlines, Dallas; UTAH—Utah Airlines, Salt Lake City; VERMONT—Vermont Airlines, Burlington; VIRGINIA—Virginia
Airlines, Richmond; WASHINGTON—Washington Airways, Seattle; WEST VIRGINIA—West Virginia
Airlines, Charleston; WISCONSIN—Wisconsin Airlines, Milwaukee; WYOMING—Wyoming
Airlines, Cheyenne.

and Abroad — ALABAMA—Southern Airways Company, Birmingham; ALASKA—Elliott Air Lines, Anchorage; ARIZONA—Pinal
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Airlines, Charleston; WISCONSIN—Wisconsin Airlines, Milwaukee; WYOMING—Wyoming
Airlines, Cheyenne.



LOCKHEED jet transport proposal, of which this is one, shows influence of modern fighter designs on bombers, but...



INTERIOR ARRANGEMENT shows available departure time present plan, particularly as one of baggage bin racks.

Lockheed's Proposals for Jet Transports

Company has several design studies, but also firm ideas on problems to be licked.

Beechcraft-Lockheed Aircraft Corp. is the dark horse in the jet transport race. Although nothing tangible has yet emerged from the company's plans, competition all agreed Lockheed is the outfit to beat in the scramble for the jet transport seat.

Late many other West Coast engineers, the Lockheed technicians have a differential of jet transport design projects (see sidebar above) but the Lockheed management has a differential of "it" it wants answered before taking a multi-million dollar plunge into the jet transport business.

► **Costs as Financing**—On the theory

problem of financing, Lockheed President Robert C. Gross believes there are several more attractive methods than relying upon legislation to provide a government subsidy for jet transport prototype development. Best method from the manufacturer's viewpoint, Gross told Aviation Week, would be for the airlines to pool their equipment requirements and then subsidize on what they considered the best design proposal submitted by the manufacturer. Even a relatively small quantity of five aircraft orders would give manufacturers to build a jet prototype, Gross believes.

Next best method would be for the

U. S. Air Force to procure a jet transport competition and finance the building of a prototype that would be commercially satisfactory and also meet military requirements.

► **Airline Health Problems**—The financial health of the airlines, Gross points out, is a critical factor in the transport market. He believes that unless the Civil Aeronautics Board allows the airlines to accumulate some financial fat on their books during the good years they will never be able to finance their equipment needs without additional government aid.

Another big "if" in the jet transport picture, according to Gross, is the operational atmosphere on which all bets on the economics of jet transports are now based. As an example, jet fuel is now much cheaper than high octane aviation gas, but if the demand for jet fuel



GROH: B-3 offers need for



SCHWARTZ: Future less need dollar



JOHNSON: Designers need CAA view

Jet Transport Specifications

(Comparison of proposed Lockheed design with the de Havilland Comet)

	Lockheed	Comet
Gross wt.	118,000 lb.	105,000 lb.
Passengers	40 to 50	10 to 15
Cruising altitude	51,000 ft.	40,000 ft.
Cruising speed	518 mph	460 mph
Range	5,180 mi.	2,450 mi.
	(Against 60 mph head wind plus 45 min. re-serve)	(Against 90 mph head wind plus 200 mi. re-serve)

expensive high-octane consumption the great variation will probably be revised.

Gross indicated that a USAF proposal to operate North American B-45 multi-jet bombers on a test range now would be a step in the direction of providing accurate data to replace the assumptions now used. He also advised SACrems to follow closely the progress of the de Havilland Comet and make use of its experience and operating data as much as possible.

Gross also feels that foreign agencies have not yet reached a state of sufficient reliability for commercial transport use. He believes that airborne people must wait for much more reliable jet powerplants before they can venture into commercial projects.

Location of the test market for jet transports is a problem that all West Coast sales departments are trying to solve. Lockheed's sales manager, Len Schwartz believes that even dollar-cost foreign airlines will accept the necessary dollar to buy American jet transports that offer the ability to tip the hand overseas now. Schwartz thinks the prime market segment will be for a trans-Atlantic jet transport that will enable foreign airlines to earn American travel dollars.

Johnson on Problems—Lockheed designer Clarence L. Kelly Johnson thinks the technical problem involved in jet transport loading is smaller than those that enveloped the recent setbacks when it produced the Star Bomber 247 and Douglas DC-7.

Johnson points out that the military high-speed flight research program that he already produced a copy of reports on jet transport design has also produced a store of basic design data for high-speed jet transport design.

Sticking Problems—"As a matter of fact if you took the platform of a good jet transport design and superimposed it on the platform for the Lockheed X-50 prototype fighter, there would be little significant design work," Johnson informed American West.

Airway system problems to be solved in jet transport development, according to Johnson are:

Sticking Johnson points out that air traffic control is still being run on a 1918 vintage rule and that more improvements could be derived from military experience in fighter control and interception techniques. Some form of completely automatic approach to the landing runway will be required for jet transports to function as accurate

approvals under all types of weather conditions. The cost of this equipment must be measured against the high cost of fuel that would be consumed by jet during initial approach and "loitering" in old-fashioned traffic stacks.

Fuel location. The large quantities of fuel required by a trans-Atlantic jet transport will cause that substantial quantities of fuel must be carried in the fuselage. Wing tanks are another possibility, but as Johnson agrees they offer too great a hazard in "whorls" (catastrophic) landings. Johnson proposes to locate fuel tanks above the cabin floor level over the center section of the wing in double cell type tanks.

(This is the third of a series on B-3 jet transport development problems. These articles were prepared by Anna Weiss, West Editor Robert H. Wood and News Editor Robert Hutz who are currently covering the development and progress of Lockheed West Coast transport manufacturers. They were written before Mr. Hutz left American West Jan. 1 to join the public relations staff of General Aircraft Corp's Pratt & Whitney aircraft division.)

Landing and take-off aids. Johnson believes that a light type of afterburner designed specifically for commercial use will be standard equipment for jet transports. Such afterburners will provide up to a 40 percent increase in engine power for intervals up to 30 seconds, he believes. To keep landing runs within the dimensions of current major airports, Johnson believes designers must "bury up" the plane with artificial devices to destroy wing lift after touchdown. Reverse (ATO) and the danger chute are other possibilities.

Pressurization. Jet transport cabin construction must be as pressure tight

as submarine hulls, Johnson believes. At 30,000 ft. altitude, he says, there is a realistic possibility of blowing a cabin door or window on a conical time point. He also points out that Civil Air Regulations now require outward opening doors which would be unsuitable for operations on a high altitude pressurized jet transport. Jet engines amplify pressurization problems, since cabin air can be drawn directly from the compressors and fuel provided from the tail pipes without any machine superchargers or booster-locks as a subject of major importance.

Crews. A four-man crew including two pilots, flight engineer and radio-telegraph operator will be required for jet transports, Johnson believes. He also thinks a thorough training program will be required for airline pilots to get rid of their present concepts and learn the proper techniques for jet transport operations.

Cost loads. Jet transports must be of heavier construction to take the loads imposed by high altitude gusts, especially at high speed, according to Johnson. The point is that steep climb wings have an alleviating effect on gust loads. He cited his own experience of locating himself in turbulence in a straight winged TF 80 while the engineers, NACA, flew smoothly alongside. Johnson also believes that shock-mounted or spring-loaded seats are a possibility to aid passenger comfort in the steep, short bursts that a jet transport would use. Another factor for jet transport will be whether such loads are capable of loading thresholds according to Johnson.

Johnson also believes that the aircraft industry designers should keep the Civil Aviation Administration informed on their proposals and try to get laws conscientiously from CAA on whether it will approve or reject their suggestions before a firm goes to the expense of building them. Johnson pointed out that CAA's position on these controversial points in jet transport design must be clearly stated before any manufacturers can afford to proceed on building a jet transport prototype.

Congress' Problems in Aviation

Fundamental military and civil issues face returning legislators, with budgets, safety and B-36 topping list.

A heavy aviation program is on the agenda of the new session of Congress at its opening in Washington. Up for legislative action are:

B-36 investigation. The House Armed Services Committee is expected to back the Air Force decision to cancel today a defense on the long-range B-36 strategic bomber in a forthcoming report evaluating explosive technology at hearings last summer over the USAF Navy controversy over the plane. The committee's preliminary staff has prepared a report of more for consideration at the committee's first meeting.

Chairman Carl Vinson (D, Ga.) has announced the report will cover the career of Adm. Louis DeWilde as chief of naval operations.

Appropriations. USAF is expected to get a \$41 billion allocation in the President's \$11.5 billion defense budget for the 1951 fiscal year. Congress voted USAF \$10 billion this year. Its all-gate capacity for jet transport to add more efficient spending points to cutbacks in next year's funds for Civil

Aeronautics Administration, Civil Air Service Board, National Aeronautics Council, National Aeronautics Association as well as USAF.

Commerce Department reorganization. The President is expected to recommend a reorganization plan shortly, to become effective in 60 days, unless vetoed by Congress. Under the House Committee's proposal to the President, CAA would be merged into an overall "transportation agency." CAA would keep its independent status. Secretary of Commerce Charles Sawyer, however, has urged that the department be given control over the Board, as well as Interstate Commerce Commission and the Maritime Commission so that a uniform administration policy can be applied to all forms of transportation.

Commercial aviation. Senate Interstate and Foreign Commerce Committee's investigation of an economic study report of two reports: A Department of Defense report pertaining to the national defense requirements for



CANADIAN ALL-WEATHER FIGHTER

First photo of the new Canada CF-100 all-weather fighter shows the extremely low wing loading. The two-place fighter is designed for speeds of around 675 mph, carrying single intercepter role, and four engines. Wing incorporates drop-in fuel tanks to be used on German FV. The CF-100 is

under test in preparation for first flight at Malton Airport near Toronto with W. A. Warren, chief British jet pilot for Canada, at the controls. The Area photo was first described and pictured in *Aviation Week*, Nov. 8, 1948.

commercial aviation support, and a major by Enact & Enact, management consultants, preparing forecasts for determining "turnover" or "outlay." The defense study is expected to influence heavily congressional attitudes toward civilian aviation regulation, size of airport, airline subsidization and governmental financing of commercial airports and transport aircraft. The Enact & Enact study will give the way for legislation separating "turnover" and "outlay" projects.

- **Air studies.** Professional staff of House Interstate and Foreign Commerce Committee is laying the ground work for an early investigation of air traffic. It is expected to culminate in a recommendation for creation of an independent Air Safety Board, being advocated by the committee's chairman, Rep. Robert Cramer (D, Ohio).

- **Transportation tax.** Outlook for reduction or complete repeal of the 15 percent tax on air transportation of persons and the 3 percent tax on cargo is excellent. The President is expected to recommend reduction, with loss of revenue offset by increases in corporation taxes. House Minority Leader Joseph Martin (R, Mass.) will press for repeal. Legislation reducing the tax on persons to 10 percent, approved by the Senate Finance Committee, is due for early action. Sen. Warren Magnuson (D, Wash.) and Sen. Harley Kilgore (D, W. Va.) have introduced an amendment eliminating the tax.

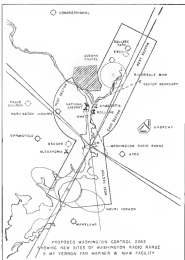
- **Plant relocation.** Controversial problem of strategic location of key defense plants and installations will be taken up by the Joint Congressional Atomic Energy Committee in its language on defense for atomic warfare, scheduled to open shortly. Meanwhile, a group of inconspicuous from West Coast and eastern industrial states have joined forces for a drive against the reported government program to relocate ordnance to their "key target" areas and defense industry behind their own country. Leaders of the group are Sen. Magnuson and Rep. James Patterson (R, Conn.).

- **Manpower investigation.** Manpower subcommittee of the House Subcommittee on Manpower, headed by Rep. Everett Coffer (D, N.Y.), will continue to investigate the effect USAF procurement has had on economic concentration in the aircraft industry. The probe will be delayed until an investigation of the steel industry is completed. The subcommittee may later look into concentration of business in the aircraft field.
- **Government relocation.** Joint Committee on the Economic Report, headed by Sen. Joseph O'Mahoney (D, W.Va.), will study reasons behind public reluctance to resist an inland and aircraft stocks as well as general public resist-

ance to risk investments. Committee seeks ways and means to overcome the reluctance and stimulate private enterprise economy.

- **Air installations.** The \$600 million national defense public works bill and legislation authorizing an air analysis, have top priority for early consideration. The public works bill, already passed by the Senate, provides for a

\$30 million expansion of Marine Air Force Base, a \$25 million expansion at Lawrenceville, (Ga.) AFB, a \$10 million expansion at the Tyndale, Calif., Naval Ordnance Test Station, and other air installations expansion. The academy bill is entangled in a fight over its location. USAF's selection, Randolph Field, Tex., is expected to win over other suggested sites.



New Plan for Washington Traffic

CAA's plan, which is aimed at adding more restrictions to traffic in the zone, meets strong opposition from AOPA.

A four-part plan to extend the Washington air traffic control zone and put additional restrictions on traffic operating in the zone is being circulated

by CAA Federal Aviation Acting Director Joseph Blatz. This is aimed at preventing collisions such as that between an Eastern Airlines DC-4 and a Boeing pilot in a P-51.

Plus included they immediate con-

cern from Aeronautics and Pilot Association, which made the claim that no strong regulations "thoroughly cover any Washington area traffic problem" if pilots will abide by them and if they are promptly and thoroughly enforced.

- **Extend the existing Washington control zone to 15 mi.** southeast of Washington National Airport.
- **Divide the control zone into east and west sectors** to aid in separating operations between Washington National Airport, Annapolis NAS, and Bolling AFB.
- **Require functioning two-way radio** for planes operating in the zone and require two traffic control channels before operating in the zone.

Exception: Aerial operating to and from and in the traffic pattern of airports in the west sector other than Washington National are not required to comply if flown at or below 1000 ft above the ground, and if the plane is either in the traffic pattern or along the shortest route across the zone to or from the airport. Military aircraft in the east sector may operate in and out of Annapolis and Bolling fields with out traffic clearance from Washington National tower if operations are at or below 1500 ft, and weather is 2500 ft ceiling or higher with 3 miles or more visibility, and military tower has given traffic clearance, and military tower is in coordination with Washington tower to prevent conflict in using runway.

- **Prohibit pilots operating in zone with "unusable" traffic information.**

AOPA's criticism of the plan, voiced by J. B. Hartsfield, Jr., general manager, attack it as unnecessary and over-pious, and as actually increasing hazards in the area.

"How can such a plan be effective when in the preliminary meetings which provided announcement, in which AOPA participated, even some of the country's most skilled pilots and military fliers were frequently confused?" AOPA asked.

Three experts (Eric Field, Queen's Chapel and College Pilot) are actively excluded as the zone (estimated portion) control zone, thereby making the legal warfare maximum to a point where the average non-military civil pilot would no longer be able to use those fields legally at present time maximum.

Question that pilots fly no higher than 700 ft above the ground is the



NEW 707-A DETAIL PHOTOS

fastest at North American Aviation's Rock Isle on Los Angeles Airport. In handling details of 707-A's take-off, pilots may be delivery to the USAF. Dive brakes open from the sides of the high speed 707's fuselage, when pushed by hydraulic arms against the streamlines, to

enable the fighter to make a steeper dive or to make a quick landing. "Small ones can change the 707-A's tailpost completely (G.E. J-47) in one hour, thanks to the construction which puts thrust and air flow together just out of wing, with only four bolts.

Since initially set for the northwest and southeast legs of the proposed zone." It concluded with a general observation that improved visibility in all aspects would make for greater traffic safety.

(The AOPA letter to the CAA proposal is significant in that the Association is the strongest and the most outspoken spokesman for private flying interests, as a consumer group with some 10,000 members. With the decline of National Aeronautics Assn. AOPA is expected to inherit the argument as U.S. representative of the Federation Aeronautique Internationale soon.)

Proponents of the proposal for segregating military aircraft from the Navy and Air Force bases, generally would require them to operate in the east and mid-aircraft in the west of the Atlantic and American bases when in the immediate vicinity of the National Air port. Only exceptions would be a few "VIP" military aircraft specifically authorized to use National Airport. The requirement, however, would not prevent "properly equipped" military aircraft from making instrument approach to the Hologic and American bases through the west sector.

Justification over airport within the overall time up to 1980 it would be assigned in the Washington tower, with 1980 it as the top altitude to be assigned as an aircraft.

Washington Air Route Center would have jurisdiction over airspace above 5000 ft., with the lowest altitude for a to use in aircraft segments at the 5000 ft. level. Plans calling for the use of 1980 ft. or above, are subject to clearance from the center.

Airways cleared into the traffic pattern would be operated at not lower than 1200 ft. until receiving landing sequence instructions. Clearance into patterns would specify right or left pattern and pattern altitude, traffic information about other aircraft.

General data for industry comments in the GAA proposal was Dec 26, but GAA recognized the complexity of the time limit and has extended it without setting a definite limit, as of

the present. The AOPA comment, one of the first to get in, was dated Dec 21, and barely got under the original limit.

Turboprop Seen Best for Long Range

A. E. Russell, chief designer, Bristol Aerospace Co., presented strong arguments that the best field of application of the turboprop engine lies in long range aircraft, in which it can prove even more economical than the current reciprocating engine, as he pointed out in the 13th Wright Brothers Lecture. The lecture series is sponsored by the Institute of the Aeronautical Sciences and held each Dec. 17 in Washington, D. C.

Russell, designer of the large Bristol Beaufort I, in the second model of which turboprop power plants are to be installed, gave a comprehensive view of turboprop characteristics and an analysis of design features that determine the performance and efficiency of turboprop-powered aircraft. Typical aspects of his paper were on structural analysis of transport aircraft powered by this high-powered, low-revving engine. Russell believed that the combination of low rev, simplicity, reduced maintenance, low vibration and light weight of the turboprop engine greatly simplifies the problem of aircraft designing and aircraft structural design.

The meeting was directed by William Littlewood, independent engineering, American Airlines, and featured prepared comments on the lecture by R. M. Hines, Allison, N. J. Bell, Polytechnic Institute of Brooklyn, Roy D. Kelly, United Air Lines and Abe Silverstein, NACA Cleveland Laboratory.

Glenn Martin Sells Chemicals Division

Sale by Glenn I. Martin Co. last week of its chemicals division to U. S. Rubber Co. at a price reportedly in excess of \$5.5 million set the Baltimore airplane manufacturer involved in the aviation business and suggested its liquid capital position doubtless.

In the transaction U. S. Rubber acquired the Maxwellville plant owned at Pennsylvania, Ohio, laboratory development in Baltimore, patents, and the traffic name Maxwell, and other assets at the chemical division. The Maxwell plant, said largest vinyl plant in the U. S., and one of the main sources of its type, will continue to produce Maxwell vinyl resin for sale to plastic products manufacturers, as a part of U. S. Rubber's Niagara chemical division. Sale completed a Martin project to divest itself of all non-aviation interests and concentrate its efforts in development and manufacture of airplanes, special equipment and aircraft related products.

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B-36 ALL-WEATHER DOCKS

Flow of these low-cost all-weather service docks for B-36 bombers have been completed at the Ft. Worth Convair plant with most being constructed. Docks extend 80 ft. in each side of B-36 wing, all being required to work on engines and wing surfaces of outside weather conditions. Docks are piped and wired for electricity and compressed air and have built-in floodlights and mobile heating units. Convair is also planning permanent ramp docks, into which B-36 can be moved. "Mechanics will be able to remove a B-36 from a permanent dock in 15 minutes and will be able to remove a mobile dock from a B-36 in 10 minutes."



the jet. Loss through radiant kinetic energy of exhaust gases leaves 6 to 30 percent of the ideal heat as useful energy available for propulsion.

Generally, well-designed rocket motors can develop from 30 to 60 percent of their theoretical exhaust velocity. Therefore, the internal efficiency of a rocket motor may be taken as 50 percent, and it is of interest to compare this value with the 30 percent of the reciprocating engine and the 15 percent of the turboprop engine.

This provides the surprising fact that a rocket motor actually is *less* efficient internally than a reciprocating engine and *more* than three times as efficient as a turboprop engine.

The question naturally arises: If this is so, then why is the fuel consumption of the rocket motor so many times higher than that of the reciprocating and turboprop engines? The answer lies in a consideration of the overall efficiency of aircraft engines. Expressions for this efficiency are:

$$\eta = \eta_i \eta_m \eta_p$$

in which η_i is internal efficiency, η_m is internal efficiency, η_p propulsive efficiency.

Propulsive efficiency introduces the speed of the vehicle into the efficiency calculation, since it is the ratio of the rate of change of the vehicle kinetic energy to the rate of kinetic energy expelled in the jet. For the reciprocating propeller and the turboprop engine:

$$\eta_p = \frac{2v}{v + v_e} \quad (8)$$

in which v is velocity of vehicle/velocity of jet, or velocity ratio.

It is seen from Eq. (4) that propulsive efficiency is at a maximum (0.6) when the speed of the vehicle equals the speed of the jet or, in other words, the velocity ratio is unity. Eq. (4) also indicates that a propeller or turboprop-driven aircraft cannot fly faster than the speed of its jet because such a situation would require a propulsive efficiency greater than unity which is, of course, impossible.

Propulsive efficiency for the rocket-powered vehicle is given by

$$\eta_p = \frac{2}{1 + \gamma} \quad (9)$$

In this equation, maximum propulsive efficiency is also obtained at a velocity ratio of unity but comparison with Eq. (4) shows clearly that the rocket-powered vehicle can exceed its jet velocity, although its efficiency falls off with velocity ratio greater than unity. Fig. 2 is a plot of Eq. (9) and indicates the manner in which propulsive efficiency drops off after a velocity ratio of unity is exceeded.

To compare representative power-



Fig. 8: Propulsive efficiency vs. velocity ratio



Fig. 9: Flight speed vs. exhaust gas velocity

plants, a plot of Eq. (9) can now be made showing the overall efficiency of the jets at various flight speeds. It is apparent, of course, to make a variety of comparisons in the comparison of Fig. 3. The internal or thermal efficiencies assumed are: Liquid-driven propeller 0.5, turboprop engine 35, and rocket engine 50, and the propulsive efficiencies with flight speed in the heavier aircraft. Fig. 3 shows that when and at the flight speed of a rocket-powered aircraft or vehicle can be increased to a high enough value, then the rocket is as efficient a power plant as any other.

A comparison of Eq. (1) and (5) show the associated design difficulty in the rocket. Eq. (1) indicates that a high jet velocity is necessary to obtain high thrust. Eq. (5) shows that a high velocity ratio is required for propulsive efficiency and this is obtained only by making the vehicle speed closely approach the jet speed, that is, it would be desirable to have a comparatively low jet velocity in order to bring it down to the velocity of the vehicle speed. The design problem for a rocket-powered aircraft, then, is to combine the highest possible jet velocity with the highest possible velocity ratio.

Design Parameters.—Since, from Eq. (1), the thrust of a rocket is determined by its propellant mass flow and the jet exhaust velocity, the thrust may also be expressed in terms of the pounds of fuel burned every second. Therefore,

$$F = \frac{F}{V_e} \quad (10)$$

and, rearranging,

$$\frac{F}{W_p} = \frac{V_e}{V} = 2 \quad (11)$$

The term on the left is an expression for the thrust produced for every pound

of fuel burned per second and, therefore, is given the special name *I*, specific impulse. Its dimensions are in seconds. This is a basic criterion in rocket design, since it is apparent that it determines directly the exhaust velocity of the rocket motor. Expressed in terms of fuel chemistry

$$I = \frac{1}{g} \sqrt{\frac{2\gamma}{\gamma-1} \frac{R T_c}{M}} \quad (12)$$

where γ is ratio of specific heats, R , universal gas constant, T_c , combustion temperature (°K) and M , propellant molecular weight.

Inspection of Eq. (12) indicates that specific impulse varies in the square root of the absolute temperature of the gases in the combustion chamber and inversely as the square root of the molecular weight of the propellant.

It follows that our first requirement, high exhaust velocity, is obtained by high combustion temperature and low propellant molecular weight. However, the pressure within the combustion chamber increases in approximately the fifth power of the temperature, so that temperature increase plus temperature demands on combustion chamber strength.

Velocity.—The problem of rocket nozzle velocity is complicated by a wide variety of factors but the relationship may be simplified by neglecting the variation of gamma with altitude (higher), the effect of drag (which is of consequence only at very low altitudes) and variations in flight path. Within these limitations, the equation for rocket velocity simplifies to

$$V_e = V_i \ln \frac{W_i}{W_f} \quad (13)$$

where V_i is rocket velocity, V_f jet velocity, W_i , gross weight at launch, and W_f , empty weight. The expression W_i/W_f is given the special name "mass ratio" and is a vital criterion in rocket vehicle performance.

To obtain maximum performance, the rocket must obtain maximum propulsive efficiency and, as shown by Eq. (5), this occurs when rocket speed equals the jet speed. Turning now to Eq. (5), it is seen that V_e can be made equal to V_i by setting W_i/W_f equal to e , or 2.71828.

Then, the rocket obtains its maximum performance when its mass ratio is about 2.72. Eq. (13) also indicates that $V_e = 2 V_i$ at a value of the mass ratio of e^2 , or about 7.4, $V_e = 3 V_i$ at a mass ratio of e^3 , or about 20.1, etc. It is to be noted that the absolute magnitude of the numerical values of V_e or V_i is that velocities in mass ratio often an effective control over the problem of equating rocket and jet velocity. With the exception of velocity, which is usually a tiny fraction, differ-



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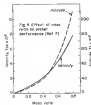
most between the empty and gross weight of a rocket as propellant. Therefore, $W_0/W_1 = W_0/W_2$, in which W_2 is fuel weight. The equation W_0/W_1 therefore can be written in terms of the fuel weight as

$$\frac{W_0}{W_1} = \frac{W_0}{W_2}$$

For simplicity, the term W_0/W_1 is also termed the mass ratio expressed as fuel weight as percent of gross weight.

► **Mass Ratio Effect**—The profound effect of mass ratio on rocket velocity is shown in Fig. 4, also containing its alternate ratio, and which is a typical form for the curve. It is seen clearly that variable gains in rocket performance can be obtained by rocket mass as structural weight as a rocket velocity.

Although rocket accelerations are not high (5g, compared to 3-12 in aircraft engines), the fact that the fuel load must be contained "loose" presents structural problems relating against light weight. The mass ratio of the V-2 was 0.63, including the 2150 lb. warhead. With this weight included the mass ratio was 0.70, which would indicate the present reasonable limit for practical construction.



One promising method of avoiding the limitations of rocket power outlined above is the use of the step, or multi-stage rocket. This arrangement consists of a smaller rocket mounted in the nose of the main rocket. The smaller rocket continues to fire successfully upon the end of firing of the main rocket, which drops off at this point moment.

A recent example of this arrangement was the firing of a "Waco Goliath" rocket from the nose of a V-2 at White Sands Proving Ground, New Mexico. The Waco Corporal achieved a velocity of more than 5000 mph and an altitude of better than 150 mi, whereas the V-2 alone attained only a little over 100 mi and a velocity of about 1500 mph.

► **Step Rockets**—The advantages of this arrangement are obvious, since the second stage velocity is simply added to that of the first stage, resulting in ever-increasing high velocities and, therefore, performance efficiency. The main aim of the combination consists of the end load of the primary stage divided by the gross weight of the combination.

If it is assumed that the mass ratio of both steps are the same, then the second step will attain a velocity twice that of either stage alone. This principle is, therefore, of extreme importance in obtaining the high velocities required for long range missiles.

It was this arrangement that was to have been used by the Nazi "A-4" rocket, which was an A-4 (referred V-2) mounted in the nose of the "A-10" booster and intended for bombarding the American coast. Combined weight was estimated at about 55 tons, and calculations indicated that it would, indeed, have spanned the Atlantic Ocean. The project was never completed, however, because of the "Nazi defeat."

Mahon and Sternbach¹ have shown how a rocket powered by

oxygen-hydrogen and ethane fire steps could attain range velocity yet weigh only 8,150 lb fully loaded. The rocket would carry a 10-ton payload and have an initial thrust of approximately 40,000 lb.

► **Aircraft Use**—Application of rocket power to aircraft requires interpretation of the foregoing relationships into the more familiar design parameters.

For example, a wing loading of 200 lb./sq. ft. in a conventional aircraft, requires a takeoff speed of about 200 mph at sea level. However, if we provide this airplane with rocket thrust equal to 0.5 of its takeoff weight, we can reach this takeoff speed in only 12 sec. and will need only 1750 ft. of runway.

An interceptor weighing only 11,000 lb., of which 7,000 lb. is propellant, could reach 60,000 ft. in just 31 sec. from takeoff and cruise at 600 mph. However, the range of the design is only 77 mi. from takeoff. This range would be increased 14-3 percent by a 23 percent increase in propellant volume.

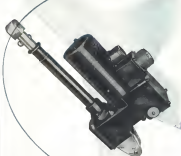
It is an apt-of-claim that the rocket-powered interceptor displays its greatest superiority. Calculations indicate that a combat version of the famed Bell X-1 would have a rate-of-climb ranging from 18,500 ft./sec at sea level to 60,500 ft./sec at 60,000 ft. The fuel would be expended at this point but the airplane would climb to 75,000 ft.

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All dimensions were still within original tolerance limits. Fuel tanks were free in their grooves. Five cylinder walls showed negligible wear, in spite of the fact that each piston had traveled thousands of miles within its bore, separated from the latter only by the thousandths of an oil film.

This freedom from excessive wear after six weeks' non-stop running suggests that for the engines, at least, the flights were more or less routine. That may explain why owners whose aircraft isn't busy their way-farers, teachers, business and industrial users, and most recently of all, local airlines—show a steadily growing preference for planes with Continental power.



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RESULTS OF LIQUID-FILM TESTS ON
TRIANGULAR WINGS AT ZERO LIFT

Film Evaporation Aids Flow Study

The National Advisory Committee for Aeronautics has successfully adapted a British developed solution to one of the most difficult wind tunnel research problems—accurate detection of boundary layer flow transition.

The new "liquid film" method originally was developed for use in turbulent wind tunnel boundary layer research by W. E. Coy of the Royal Aircraft Establishment in 1946. The method has now been adapted to supersonic flow study by researchers at the NASA Ames Aeronautical Laboratory.

The method utilizes the principle that rate of evaporation of a liquid film on the surface of a model is inversely greater where the boundary layer is

turbulent than where a laminar condition exists.

In applying this principle, Ames engineers first coat the model with flat black lacquer and, immediately prior to installation in the tunnel, with a liquid mixture containing glycerine. The liquid is then sprayed for a period sufficient to permit the liquid to evaporate completely in the turbulent area, but remains moist over the laminar area.

Upon removal from the test section, the model is dried with talcum powder, which adheres to the moist laminar area but not to the turbulent area, thus increasing the contrast between the two areas and permitting accurate measurement and photographing.

The fifth turntable, made of aluminum alloy (thrust and short mast), is set as a pit with its surface flush with the apex surface. It contains a dialhole trough to accommodate the dial which is one part of the C-119's main landing gear.

The rotating unit hooks up electrically with a remote indicating unit placed in the cockpit of the aircraft. When the plane has been situated in magnetic north, the indicator reads north. Then, then on, exact headings are read on the indicator and the compass magnetized accordingly.

The aircraft radio direction can be mounted on the turntable under its power as with a small truck. The new installation was developed by Wilefield Engineering Co., Canby, N. Me., Idaho.

most in high altitude operations. ▶ **Breaks Wire**—The most common criticism of aircraft electrical equipment at altitude is accelerated generator brush wear. This phenomenon, due to increase in arcing in the field-thyristor and a wide spread complaint during World War II, first showed explanation of this phenomenon is not yet generally agreed upon, but one interesting theory was offered by Max Philip Lind, Wilefield-Aeromax, at the Second International Conference on the Institute of the Aeronautical Sciences and the Royal Aeronautical Society.

He believes that the spark gaps at low altitude replace the carbon rods worn off the brushes at low and medium altitudes, and brush life is thereby substantially preserved. However, at high altitudes, where the oxygen vapor content of the atmosphere can be as little as 1/1000 of the sea level value, rapid brush wear results.

That such deficiencies are more the fault of the service than of the manufacturers is seen in a recent discussion of the problem by F. P. Wills. He points out that USAF requirements for small size and light weight in aircraft generators limit the manufacturers to use very high average brush current density. When 6 and 8-in. 50 generators first came into use, these were 221 amp./sq. in. on the 6-in. 250 amp. and 250 amp./sq. in. on the 8-in. 500 amp. generators. These brush current densities are about three times the values normally used on brushes of all other types of electrical machines.

▶ **Wire Solution**—Two answers to the problem have already substantially improved brush wear at least up to the 40,000 ft. level. Principal solution has been the use of special impregnated or metallic brushes on the brushes, which improve their durability by an estimated factor of ten and each to escape overheat hazard.

A secondary remedy factor is the use of higher dielectric strength (125-215, etc.), which reduce brush current density to about 100 amp./sq. in. with a great saving in weight of the commutator and even less brush wear than is normally obtained by special high-altitude impregnated or metallic brushes.

▶ **Mechanical Factors**—Some serious difficulties at high altitude are created by single mechanical problems and are associated with electricity. For example, the well-known problem of low sea pressure lubricants is revealed in many cases of electrical equipment such as direction finders, radio operators and many types of high speed rotating machinery. Sealing of such units for use at low pressure can often create maintenance, workability and fire hazard. Low temperature of high altitude



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also cause potential destruction and expansion of metallic parts, with serious difficulties resulting in a metal ion points.

► **D.C. Use.**—Many of these difficulties with A.C. operating machinery are being avoided by the use of a c. r. motor.

Attracting current generators do not require commutation, maintenance and contact can be used to provide a wide choice of voltage and current changes in virtually trouble-free operation. This is an ongoing reference: constant and rising air lighter because voltage is higher, etc.

However, use of a c. r. motor equipment poses the problem of development of a satisfactory constant speed drive for the alternator to prevent possible. However such drives have been developed, but both rubber and commercial agencies are still seeking improved versions.

Another new solution to the high altitude in some problems is the brushless, high frequency, line current system. This is light in weight, has no brushes and is relatively unaffected by atmospheric changes.

Continuation of increasing electrical load requirements and increasing accuracy standards is placing greater and greater responsibility on the aircraft engine. However its variability must be checked by consistent design and precision policies that incorporate research results into long-term requirements.

With the latest directions of future aircraft performance already clearly in doubt and many of the major aviation problems realized, there appears little reason to doubt that aviation performance will be achieved through design and cooperation will keep pace.

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FINANCIAL

CAB Faces Helicopter Problem

Must decide whether to authorize passenger service in New York area, when mail pay may be missing.

Helicopter payments, encouraged by tariff increases to moving island mail and service, are stirring even greater concern among the prospects of landing passenger operations.

Comments of this development would be of immediate impact to all phases of commercial aviation. One of the most anxious conditions surrounding passenger air travel today is the ice threat and time-consuming delays in conducting at congested airports, particularly with movement to and from such terminals and the custom of large cities. A demonstrated fear helicopter operators, promises to find an even wider market in public acceptance.

Scheduled passenger service by helicopter is up for determination by the Civil Aeronautics Board as two separate proceedings: Los Angeles Airways, with five years of established and operations as a backbone, applied last May for authorization to provide island-to-island passenger service over its routes. Of more immediate importance, however, is the proceeding involving helicopter service in the New York area, scheduled by a CAB hearing next week in New York.

► **Mail Pay Factor**—The New York case is without the blessing of the Post Office Department. That agency's chief element, in indicating the course of this proceeding, it raises a serious question whether CAB will act to make any award, if so, the successful applicant will be in a position to operate profitably without mail revenue.

Without active government support through and payments, a successful commercial helicopter service appears impossible at this time. It is highly unlikely that the Yellowknife Company of Cleveland, influenced by CAB in 1947 to conduct an experimental passenger helicopter operation in the Cleveland area, has not yet relinquished its service.

No mail reimbursement accompanied this award. Without the power of mail pay, it has been difficult to raise the necessary capital to launch the enterprise. The lack of suitable equipment in the past has also been a factor. A number of years ago, a commercial operation without any mail services or

even CAB authorization, Helicopter Air Transport, Inc., tried to establish mail in the Boston area but was bankrupt.

► **Air Carriers' Experience**—It is noteworthy that one of the applicants in the pending New York area case, Air Carriers, Inc., originally received a three-year authorization from CAB to conduct a connecting service from New York City to local areas. This authorization was granted primarily on the premise that the award carried with it no mail reimbursement.

Convincing its operators solely to passengers and property, Air Carriers, Inc., has been for short of raising the profitable level the anticipated. With its temporary certificate about to expire in 1950, Air Carriers dreams to combine forces with another applicant in the New York area helicopter case in the hopes of persuading its operators maintain through the possibility of obtaining mail authorization.

Only two helicopter and services have been authorized in nature, transportation of mail and property over their routes. One, including 250 mi., radiating from the Los Angeles Municipal Airport to post offices in about 40 suburbs, was authorized by CAB in May, 1949. Los Angeles Airways, Inc. was awarded a three-year certificate, effective from Oct. 1, 1947, the date service started.

Following the pioneering effort, CAB was encouraged to authorize a similar service in the Chicago area. Helicopter Air Service, Inc., was awarded a five-year certificate, effective July, 1949, to provide mail and property transportation by helicopter over three routes to taking some 300 mi., radiating from the Chicago Municipal Airport in 41 suburbs and over a divided route to the south of the main post office.

► **F.D.A. Attitudes**—Experimental helicopter service was originally approved by the Post Office Department as early as 1946. Enthusiastic support of the type operation was manifested in the 1947 local report of the Postmaster General with the following distinction: "These (helicopter) operations demonstrate the practicability and worth of this type of air service to supplement the speedy transportation by truck routes."

This strong support was confirmed in subsequent statements issued by Post Office officials and has been of prime importance to CAB in justifying the necessary mail payments including truck services.

Nevertheless, on July 13, 1948, two days before oral arguments leading to the case in the Chicago proceeding, the Post Office Department filed a petition to re-open the case. The reason for the Department's sudden and unexpected action in this instance remains obscure. CAB denied the Post Office petition. While the Post Office assumes truck services, the route is being incorporated in the revised mail schedule. CAB found such truck merchandise in they were not strictly authorized.

The denial of Post Office Department, however, has been as possible early and more conclusively in the New York area proceeding. Notice has been served that in view of the changes which have been made in surface transportation facilities in the New York area, the experimental, as well as the mail service, conducted during January, 1947, and because helicopters could not land at the roof of the General Post Office Building in New York City, the Post Office Department did not consider helicopter as such a service necessary and would not sponsor any mail in the proceeding.

► **Post Authority Approval**—This Post Office declaration represented a blow to the arguments of the hoped applicants seeking a certificate for mail helicopter service in the New York area. However, the Post of New York Airways has indicated in this proceeding seeking certification of a helicopter passenger mail and cargo service for the New York and New Jersey areas. By shifting the emphasis to passenger operations, it is hoped to influence CAB in awarding a helicopter franchise in the New York City area, even without it, of course, the right to mail service and the attendant compensation.

From the overall results achieved in the certification operations in the Los Angeles and Chicago areas, it would appear that the benefits received, both in expediting the mail and from the stimulation of the national airlines, justify the compensation.

Los Angeles Airways is currently being paid \$1.75 per airplane-mile. While on an airplane-mile basis this rate is among the highest paid any of the certified aircraft, adjusted in volume of service performed, it is closer to a non-subsidized rate than that paid new feeder lines.

The coming of a successful passenger helicopter operation will accelerate the period in which mail service by this type of equipment will be placed on a fully reimbursable basis.

—Selig Ahtshul

SALES & SERVICE

Executive Planes Replace Nonskeds

Most of Teterboro's traffic used to come from irregular carriers, but the switch is on to business aircraft.

Teterboro Air Terminal, once one of the largest air freight channels into the Port Authority, is rapidly turning into the East's main store for executive aircraft.

The New Jersey field, now part of the Port of New York Authority's four-part airport system, at one time was the headquarters for passenger and cargo nonskeds. Before the Civil Aeronautics Board cracked down, drastic cuts outlawed activity, Teterboro was the hub for one-way cargo flights and N.Y. Florida Keys and return passenger loads.

Mail Change—Then, the field was handling more than 1200 plane movements a day. In 1946 there were 151,000 flights and landings; more than 40 independent carriers used the field.

Today only a small handful of nonskeds remain at Teterboro and they account for the smallest portion of the field's traffic movements. Largest number of flights are still by flying schools. Local traffic greatly increases the overall figure. But the rapidly increasing

number of flights by executive airplanes marks a definite change in Teterboro's character.

Traffic Analysis—Here are some typical day-by-day traffic breakdowns at the airport:

Dec. 1: DC-3 and C-46 type aircraft, flown by nonskeds, numbered 17. Local and through flights totaled 258. Executive plane flights totaled 134.
Dec. 3: Nonstops, 20. Local and through, 583. Executive aircraft, 113.
Dec. 6: Nonstops, 10. Local and through, 714. Executive aircraft, 88.
Dec. 6: Nonstops, 14. Local and through, 214. Executive aircraft, 180.

Executive Service—Curtis-Mafford Air Service's new executive aircraft center (American Waco, Dec. 5) is one of the most promising developments in Teterboro's growth as the center of executive aircraft activity. The center, located near the Port Authority for about 325,000 according to official statistics, is already getting business from experimental aircraft.

The Port Authority is set for landing

and hanging transient planes at other New York area fields is high enough and sufficiently confusing to encourage use of Teterboro. Several aircraft operators sometimes have been disappointed from using LaGuardia Field because airport officials could not decide on the proper rules.

Part of Mafford's high rental fee for the 160 by 160 ft hangar will be paid by rental of storage space. Some estimates are that Mafford can make almost \$4000 per month in this way.

BRIEFING FOR DEALERS AND DISTRIBUTORS

NEW PAPER—Garrison in the 1945 four-place Paper Clipper is a new four-place with 125 hp instead of 112. Combined with considerably improved performance over the 1945 model which was the year's best seller.

NEW BELLAND—New 150 hp Lycoming-powered version of the Bellanca Crusier B- which has been flying in prototype stage for some months, is going to be a seven-seater for personal plane speedsters. First pre-production planes are beginning to come off the line now. The low-powered Crusier was a speedy plane for its power and the new one, it is claimed, will cruise up around 180 mph.

FLIGHT DEMONSTRATOR—Example of selling through letting the equipment speak for itself, is the flight demonstrator Crusier 140 operated by Van Dusen Aircraft Supply at the Curtis Van Dusen base at Teterboro. The plane carries a two-way Motorola Aircraft radio for standard voice communication, a two-way VHF Navy emergency frequency, two dual warning indicators, wheel pants, Goodyear wheels and tires, a McCauley Mot-1 prop and is finished in BuAircraft with a Re-Gla coating to top off the finish. Each one of these is a product sold by Van Dusen. The arrangement gives the sales force a chance to show dealers and customer how each works in action.

WHEEL SKIS—Combination wheel skis made by Federal Aircraft Works, Minneapolis, are now available for the following light planes: Piper J-3C, PA-11, PA-12, PA-16, PA-17, Cessna 120, 140, 170, 180, 192, Stearman 108 (Wingler), Aerostar 15 (Sokol) and Luscombe Model 11 (Sokol). Other models will be available later. Wheel skis are available with or without a hydraulic retraction arrangement which retracts the ski for the pilot to make steering do as wheel landing.

—Alexander McCauley



WHITE MIDGET SPORTPLANE

W. E. White of San Diego, Calif., plans to use his 400 lb. powered plane for designed and built in his spare time. Craft is 14 ft. long, 30 in. high, and is powered by a two-cylinder motorcycle engine. The plane is said to have carried a 160 lb. man, and to have a cruising speed of over 55 mph, and an 1800 ft. ceiling. Construction is mainly of space and fabric. When he

arrives at a Navy aviation museum at North Island is completed, White hopes to produce the plane in kit form. In the meantime he plans to sell blueprints and specifications to those who want to build their own. White says that the cost of materials would be between \$150-\$200, without engine. CAA approval has not yet been obtained on the new wing plane.



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Yes, the "Fixed" and "Floats" are the famous "PL" twins. Penco's exclusive hydraulic pump act that provides volumetric efficiencies up to 97% . . . torque efficiencies up to 90% . . . and senses these efficiencies over a longer service life.

"Fixed" is an old timer at this kind of an act. But it's "Floats" that really wow 'em.

It's the one that automatically holds and adheres to a thin film of oil, making possible maximum torque and operating efficiencies under all operating conditions. Together, "Fixed" and "Floats" make possible Penco's patented "Pressure Loading" principle of construction for gear-type hydraulic pumps. Here's their act:

"PRESSURE LOADING". How it works

The schematic illustration at right shows the three principal parts of a gear-type hydraulic pump. They are the bearing "CA" played by "Fixed" and "C" played by "Floats" and the gear ("BP"). Bearing "CA" is fixed bearing "C" floats. By means of the "Pressure Loading" principle, pressure from the discharge of the pump is transmitted through a "Pressure Loading" pin and is exerted against the rear of the "floating" bearing. This force is counter-balanced by pressure developed within the gear cavity so that the thrust of the bearing against the gears is just enough to accomplish its purpose.



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PRODUCTION



COMPACT GELING TURBINE (left) next to conventional engine of about same power.



CAN FIT INTO SMALL CABINETS where disassembled, then using storage and transport.

ready now to prove its adaptability to actual industrial jobs. With any. During reports, during the next two years, to manufacture enough turbines to permit through direct testing in a variety of industrial and vehicular applications, with large-scale production planned to follow. It has associated no production figures, but observed industrial units 15 or 16 turbines already have been built or are scheduled for construction.

Boeing believes the gas turbine is a "natural" for the field of industrial drive equipment. Weighing only 155 lb, with a continuous output rating of 150 hp, and an emergency output of 250 hp, the turbine can be conveniently mounted in a small space for operation of standby pumps, generators and compressors. It is only 18 in. long as compared to 51.2 in. for a diesel engine of the same horsepower, 21 in. wide as compared to 20 in. for a diesel, 18.4 in. high as compared to 45.1 in. 9.4 cu ft volume of ventilation envelope compared with 48.4 cu ft for a 250-hp diesel and 1 ft per hp compared to 6 ft per hp in most stationary engines.

The gas turbine has only one shaft in rotary motion at an average speed of 6000 rpm. The largest horsepower, the largest weight no more than 25 lb. In a compact distribution, the same complete, disassembled and assembled one of the turbines in an hour, using tools weighing a total of 14 lb.

Another Use—In the aircraft field, the Boeing 502 holds promise of their direct applications. It will provide a dependable quick-starting ground power unit here needed for starting large aircraft. It will serve as an excellent source of auxiliary power aboard the planes, discharges being powerful enough to carry a transmission work load not light enough to permit an weight problem. It also has promise as the powerplant for light planes and helicopters.

The Boeing Model 500 which is the 502 without the gas box, shaft and fan wheel, makes an efficient space heater which might have as useful application as a fog defogger.

Another of the turbine's most interesting outlooks is in the marine field, when research shows it readily adapts, able for powering small craft, color crystals, speed boats, launches and other boats.

Design Details—The Model 500 is an 111-lb turbine with 150 lb of thrust. Source of power is the same in both models, but the 500 produces 250 hp, measured on power of thrust, while the 502 produces 150 hp, measured in conventional horsepower.

The turbine has two major sections: the gas producer, which is a single-stage centrifugal compressor, two air

Boeing Jet Set For Market Tests

Company hopes to enter non-aircraft field with new small turbine adaptable to variety of industrial tasks.

The Boeing Airplane Co.'s long hunt for a non-aircraft uses to diversify its production now have ended with a gas turbine whose experimental prototype the company disclosed in 1947 and about which it has just revealed additional information.

Edward C. Wells, vice president of engineering, says that the Boeing Model 502 turbine is, "so far as Boeing knows, the most advanced small gas turbine for general application in the United States."

Industrial Use—The Boeing 502 is

Protective Coating

Plasti-Glad transparent plastic coating, offered by Motus Laboratories Corp., Indianapolis, Ind., can be applied to metal, wood and fabric surfaces on aircraft. Material resists corrosion and corrosion effects of weather and is repeated need to check, peel or crack in extreme heat or cold.

Coating also will not discolor under long power and is said to fully protect against rain, dirt or salt water. In addition, it is stated to be impervious to gasoline and will not soften in oil. It is not affected by acids or alkalis, attacks caused by sand and dust and is flammable. Material dries in less than 2 in. added weight/pl.



Blind Rivets

Further assembly and lower cost are advantages claimed for two new blind rivets announced by Hook Mfg. Co., Detroit, Mich.

Designed FFI (pull through) and VSP (self-plugging) type rivets, both are available in 1/8 in. to 1 in. diameters. They are furnished in aluminum alloy or cadmium-plated mild steel, with hexes or 160 deg. conical head. FFI rivets have an aluminum grip hex-hexes in 1/8, 3/16, 1/2 and 3/4 in. diameters. VSP rivets have grip hex-hexes in 1/8, 3/16, 1/2 and 3/4 in. diameters. They are furnished in 140 or 150 psi tensile strength—claimed to be more than twice the grip strength of other similar blind rivets. Splitting of rivet in stress during formation of blind head is said to be eliminated.

Blind rivets have parallel shaft pull grooves, to insure proper, during. Once inserted in the gap, they cannot rotate, pull out, or move to one side, improper drawing, and pulling surface will not break off permanently. The full in. diameter rivets are said to be self-aligning.

Fire Extinguisher

Improved fire chemical fire extinguisher Model B, introduced by Aqual Chemical Co., Merrittville, Pa., features special water-light mist in nozzle and reverse. Device has new threaded hose connection, cartridge guard finger grip and carrying handle, and is available in 20 and 30 lb. capacities.



Portable Compressor

Tyler mounted portable compressor designed for operating small air tools on maintenance service jobs has been developed by Gardner Denver Co., Chicago, Ill. Unit is compact with space economy rubber tank, roller bearing wheels, drawbar, trailer hitch and skid-steer leg, and can be easily towed behind car or service truck. Compressor capacity is sufficient to operate paint spray guns, siphoning between, and support apparatus such as light paving, leveling, spreading, and similar pneumatic equipment. These are available, each delivered for one man handling.

air, and 1 in. bore dia., with both dimensions being held to +0 -0.001 in. tolerance.

Rotary (suction) is a pressed and hardened beryllium copper, having 150,000 psi tensile strength in against 40,000 psi for steel pressed steel types.



Quick-Stopping Motor

For nothing or less cost, jobs where quick stopping of movement is needed, and where the motor must be stopped from top speed in the maximum number of turns, a high speed, reversible, 1/4 hp. d.c. motor, with built-in electrical quick-stop, is announced by Electro-Mot, Inc., 11475 Vermont St., N. Hollywood, Calif.

Specifically designed for a transport unit, it is powered at factory by a 115 volt, 115 amp, 1150 rpm, 1/4 hp. d.c. motor, operating within range of 10 to 150 degrees of arc (revolving speed) and 1/4 in. x 1/4 in. mounting plate measures 2 1/2 x 3 1/4 in. Weight of motor is slightly over 1 lb.

Tiny Ball Bearing

Stated to be smallest conventional ball bearing ever produced is the new 1/16 in. Mini-B, developed by New Brunswick Ball Bearing, Inc., Paterson, N. J. It is offered for wide range of applications in small machine tools. Design makes it specially suitable for applications in turbines and some devices.

Compared to most standard ball bearings used here, new bearing is claimed to represent 1 in. reduction in size along with 1 reduction in friction and internal surface speeds. Speed limit is 76,000 rpm, outer diameter is 1/16 in., weight is 1/16 oz., and it is available in 20 and 30 lb. capacities.

Of General (patent) design, and is fully ground and has low oil, it is

For Hardness Tests

In iron, nickel and vanadium test, Rockwell hardness testing of materials, Kennametal, Inc., Latrobe, Pa., offers "Koradene" balls, made of heat-treated material having tensile strength

Balls are claimed to have unusually great strength combined with high resistance to oxidation, thermal shock, abrasion and corrosion. They are produced ground to true spherically and close tolerances, and are available in standard 10 mm. size. In tests at 1350 F., it is reported that material showed high resistance to oxidation and that no appreciable deterioration of surface could be detected.

AIR TRANSPORT

How Is Air Coach Working Out?

Capital Airlines wonders, watching coach traffic slump as other carriers operate on same routes.

By Charles Adams

substantial part from competing TWA and Northwest coach services.

■ **Music Competition**—Wirtz, manager of morning New York-Chicago coach service by American Airlines and TWA on Dec. 27, Capital anticipated will further decline in its tourist-class business. Last month Capital announced its New York-Albany coach flights until next spring (Aeronautics, Dec. 3). The service was competitive with one offered by Eastern Air Lines.

Average passenger load factor as Capital's last coach air coach flights dropped from a high of 84.5 percent last June to 57.5 percent in November. With the western coach flights in Albany and New Orleans (started last September) included, Capital's November coach load factor was only 49.4 percent.

The latter figure indicates an operating loss since Capital estimates that as it added one coach to breakfasts last June, it lost 10 percent. On an aircraft seat basis, Capital's last, even coach load factor has been around 65 percent.

■ **Profit Code**—Despite the recent bad trend, Capital has shown no loss of enthusiasm for air coach. Company



RENAMED TO CAB

Earl Lee, Capital Airlines Board member since 1941, has been reappointed to his second full year term by President Thomas The appointment is subject to Senate confirmation.

officials point out that even on an aircraft seat basis on coach showed a profit of \$350,000 on gross interest of \$1,078,176 during the first eight months of 1949.

While impressive when compared with regular service, Capital's average air coach load factor of 75 percent during the first eight months of 1949 is not enough.

Northwest, which started four-color flights in March, reported a 60 percent coach load factor in April, 68 percent in May, 57 percent in June, 52 percent in July, 50 percent in August and 62 percent in September. During the most recent month, load factor on NWA's regular-flight flights ranged from 47 to 65 percent.

TWA, which started Kanan Canyon flights, coach operations last February with DC 3s, had an average 81 percent load factor on the service for the eight months ended Sept. 30. On its New York-Chicago Shoreline coach operation started May 31, TWA had an average 53.7 percent load factor for the last month ended Sept. 30.

■ **Costs Rise**—Study—Memphis, a new survey made by U. S. Census Bureau personnel is common with the transportation coach type service cost has shed more light on how much it has to cost to cost airlines has been during times the combined carrier.

General Bureau representatives distributed questionnaires to over 2000 passengers on 52 non-scheduled flights leaving LaGuardia Field, New York Airport and Lockheed Air Terminal during the two months from Oct. 17 to 19. Six found that the cost of the aircraft was the largest factor in the cost of the service.

A previous study made by CAB last spring (Aeronautics, Aug. 1) had shown that 34 percent of the passengers on the scheduled coach service of Capital, TWA, Northwest, Continental and Midcontinent had been derived from regular-flight service. No study had claimed that only 30 percent came from regular flights.

■ **Devising Hinges**—Of the 1947 passengers flying on the regular coach service, 77.1 (100 percent) said they would have traveled by regular-flight air if the regular coach service had not been available.

Among the respondents, 284 (15 percent) were derived from rail coaches, 41 (13 percent) from rail coaches, 41 (13 percent) from automobiles, 31 (2 percent) from buses, 115 (16 percent) were not sure how they would have traveled if air coach had been available, and 25 (1 percent) would have gone by more than one form of transportation.

■ **New Business**—Additional proof that air coach figures actually are better than seen in the reply of 478

STRICTLY PERSONAL

UNDERHILL MAKES THE PILOT—G. H. Moonader, general traffic & air manager of Laramie, writes from Mexico City about a new Laramie ticket agent who had just obtained his respondent's address and struck up a conversation with a fairly stranger at a hotel reception. The new agent, a hot customer of his respective appearance, continued modestly, "Was a pilot with Laramie?" The stranger was so interested that the agent described the other he flew in, and finally was led into a detailed description of a typical landing procedure. The stranger finally presented his card. It read "Chief Pilot of Laramie."

PINTON ISN'T LOST, CREDITY IS—Our Strictly Personal column asking the whereabouts of Walter Pinton was kindly off the press before Republic's Ken Pinton called to say Harold Pinton at 112 Manhattan W. 44th St., Manhattan, L. I. N. Y., 50 lbs. like chicken has a 100% record for locating lost aviation people. — John Cready of Pan American's public asset bureau says he has positively stopped the flow of alleged whoriness in the column in favor of the New Yorker. The latter, inter-lamous up, actually sent him a check for \$15 "Why give it away when you can be paid for it?" says he. But it is as much fun, being a pie, Cready?

MAYBE IT WAS SCOUTING—According to A. A. Boon Hensick, some weeks ago the Commonwealth Club in Los Angeles staged a tag campaign-capturing wild. Picking Sticks was set up to include the dyspeptic and the contributor, lured a Hilde 300 helicopter from Pacific Helicopters to turn out one (two was one count 'em) and finished. For the statistically minded, these weighed out 50 pounds. The helicopter descended to 300 feet and turned the heliport out with a flourish. Shortly thereafter, telephone began to ring at the Society for the Revolution of Cressly to Anaseth. Society later was conspicuous that the city had found a new way to kill off the birds in Pecking Square. They were doing this up with a Helicopter, and the bloody feathers were coming out of the city. Boon says, "If I hadn't been in the office when the calls came in, I'd never believe it!"

A HOT POWERED WARE, FROM A WRITER—That most literary of advice column, Mr. Sheridan, must be writing a manual (need) He takes a moment off in pen to a real.

"It is hard to be elegant about answers; here is just one and after another!"

OLD TIMES—If you love of the whereabouts of an aviation "old timer" let us hear from you. Julia W. White of Tempe, Fla., reports Gene Whitcomb, former military aviation chaplain and Cleveland scout and plant designer, is in Tempe, manufacturing insurance device such as (pen) needles. But he is still accompanied "He mostly worked up a Land Speeder as an auto home..." Bender White, one of several complaints recently, adds "Try to get the column in the magazine some other, we miss it down here."

THE CHILDREN'S CORNER—With this issue we open a Bright Sayings dept., but a bit curiously. Bob Boylan complains to the Aviation Writers Association Newsletter "I understand Aviation Writers has an idea that has been hanging on the corner of the Strictly Personal column since the birth of our baby, Robert [Boylan, Jr.] The new topic the boy's first comment was AWA. By the time I would get around to printing that, A. [Boylan, Jr.] will be able to play and sing 'Mule Train.'" Story, Bob? We checked and discovered the position, who even enjoy the parts of this column that are crowded out each week, get tired of reading your story and failed to see the correct galley prints being it appeared in the magazine. —R. H. W.

WHAT'S NEW

News Books

Just All the World's Aircraft 1949-50 edited by Leonard Duggan is a fourth year, the internationally famous volume continues to update the reputation of being the outstanding authority on civil and military aviation. This edition contains the latest facts and figures on the aircraft and engines of 43 nations, and there are over 1600 illustrations, including thorough drawings. U. S. aviation industry dominates the several sections, having 55 pages and 215 illustrations.

A three-column layout has been introduced for improving readability and giving greater flexibility in choice and location of photographs. Specifications and other data are divided, and a high standard of accuracy is maintained.

To seek the latest articles, there are included historical articles by two of aviation's pioneers, Gene L. Martin and Sir Percival, Stanley Day, reviewing the progress as well as the aircraft in our times. There is also a special article by Air Commodore F. R. Baskin in which he reviews aircraft design projects in the world.

Whitney-Hoe, McGraw-Hill Book Co., 310 W. 43d St., New York 36, N. Y. are the publishers and the translators for the United States, Canada, and South America. Management with the English publisher, Warplane Law, Mission & Co., Ltd. Price of the volume is \$16.95.

"Modern Arms and Fire Men" by Vincent S. Roth. Here is a carefully considered appraisal of one of the nation's top scientists, at the role fire science played in winning the last war, and how it can be used to help settle the growing problem of a world against a world war of ideas.

Dr. Roth analyzes the research work made by the Germans and Japan in the last conflict, and explains how in many instances the enemy utilized the efforts of his own scientists and technicians to perform hazardous tasks.

The author sounds a warning that we need stress continued accumulation of fundamental scientific knowledge. "Should a new war have to be fought in a decade or so, there will be innovations, but in all serious probability no such burst of new devices as occurred when appeared science and engineering first turned their full effort into war, during without inhibition an instant upon the great unshared accumulations of the past."

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EDITORIAL

How to Promote the Copter?

This is a delicate subject. Because in no way is this plan an invitation for anyone to invest in any stock and run an unusually dangerous risk of losing money. Let it be made clear that we have in mind only that sporting segment of the public who are constantly seeking new opportunities in frankly speculative areas.

Presidents of two powerful helicopter manufacturers have poured out their hearts to us in recent weeks on the flight reception they have been handed in the hallowed financial district of New York City.

The technical merits and sales possibilities of the individual machines seem either unimportant to most underwriters, promoters, consultants, and those who suggestively catch their wits in Lower Manhattan to contact ones. Instead of intelligent questions, the strong-gung young helicopter spokesman gets the same story everywhere:

"The public just isn't interested in helicopter stocks these days, even in speculative areas. We wouldn't be able to sell your stock if we offered it."

We think this is the lay man's answer. A more accurate admission might be:

"Frankly, we are afraid to come out with a helicopter issue. We divided on the helicopter brokerage several years ago with some of the best houses in the Street. We tried to cash in on the publicity hysteria for helicopters then, didn't make enough investigation of the technical problems connected with the machine we promoted (or underwrote), and got burned pretty. Even if helicopters are good, we're through dabbling in them for a while."

Now, we don't consider these unfortunate for protecting serious, once-again-garbled patches of their financial institutions. But we think the odds are unfair.

Too many backing helicopter schemes have failed. True. And the public has lost too much money on them. True. But suppose the underwriters and promoters had paid even half as much attention to investigating the technical merits and sales possibilities of the individual machine as they did to the intricacies of the underwriting agreements. We believe there would have been fewer fops and therefore fewer financially distressed entities.

The opinions of these venal and avaricious financial gentlemen, in the contrary, we respectfully contend that the great unenlightened public would still be wiser to invest in a new helicopter venture—after someone with a good reputation has done a reasonable amount of engineering and sales analysis—than in many other equally speculative issues in utilities, gold and uranium mines, and telephones. And we shudder to think how many good interests are

losing their dollars in television stocks because some of these same underwriters are merely cashing in on the current public craze. Yesterday it was helicopters.

Certainly, there must be promising yet small helicopter projects in many a garage and back room that, somehow, deserve some independent and expert technical analysis. Certainly the worthy projects deserve at least an equal break with some of the bright, new television companies, which they are not getting.

As far as we are able to discover, those whose business is promoting or selling even frankly speculative stocks are doing little if any independent research, they are relying in on the public craze of the moment.

So let's don't blame the public for the mistakes of others. Give the public a sporting chance and there will always be a limited segment who will select an aviation stock to ride. The helicopter has a brilliant future, and the public knows it, even if the underwriters don't. But, we must admit, this postponed conclusion still doesn't help the little helicopter man. Somebody should.

Full Fare Luxury for Cargo

Airlines has more striking contrasts than anybody else's business! On a recent visit to the West Coast we discovered that one airline which has been steadily on such because it said it took so much pride in offering its passengers only first class, luxury service has been juggling cargo in the forward section of passenger cabins recently.

Special Award

Although it is possibly an intra-company matter, we believe you readers may be interested to learn of a special award to **AVIATION WEEK**. This publication was selected as the magazine "with the most outstanding record of accomplishment" in the McGraw-Hill company, in 1960. There are 26 domestic publications under the company banner. Company executives, including Mr. James H. McGraw, Jr., the company chairman and president, approved of the award to **AVIATION WEEK**.

In a special memorandum to Robert F. Roget, the magazine's publisher, they pointed out that **AVIATION WEEK** has won reader preference studies consistently and devotedly. Its subscriber renewal percentage has increased steadily. New subscriptions have been sold with relative ease and low cost. It has the largest gain in advertising page volume of any McGraw-Hill magazine this year.

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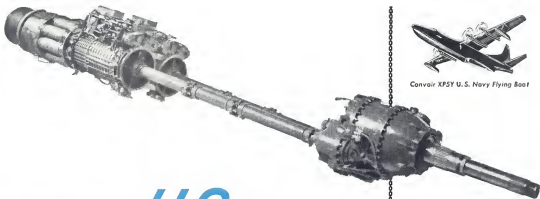
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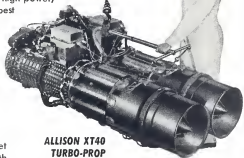
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